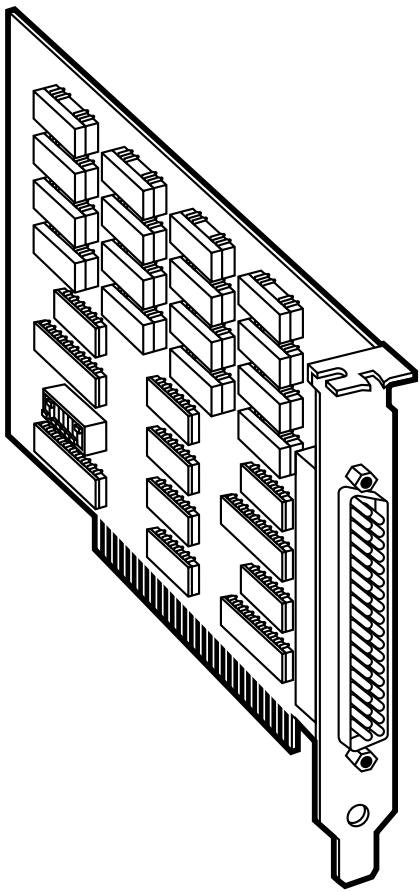
BLACK BOX®
NETWORK SERVICES

MAY 1999
IC901C

16 Relay I/O Card



CUSTOMER SUPPORT INFORMATION

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FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

CE Compliance

Products bearing the CE label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

- **EN55022 Class A —** "Limits and methods of measurement of radio interference characteristics of information technology equipment."
- **EN50082-1 —** "Electromagnetic compatibility — Generic immunity standard."
- Part 1: Residential, commercial, and light industry.
- **EN60950 (IEC950) —** "Safety of information technology equipment, including electrical business equipment."

WARNING

This is a Class A Product. In a domestic environment this product may cause radio interference in which case you may be required to take adequate measures.

Always use cabling provided with this product if possible. If no cable is provided or if an alternate cable is required, use high-quality shielded cabling to maintain compliance with FCC/EMC directives.

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1. Specifications

Compliance —	CE approval; FCC Part 15, Class A
Channels —	16 Relays
Output Relay —	200 million operations 10-VA resistive load
Throughput —	660 Hz (relay maximum operating speed)
Relay Contact Power Ratings —	10 W maximum
Relay Contact Voltage —	100 VDC or VAC maximum
Relay Contact Current —	0.5 A DC or AC RMS maximum
Relay Contact Resistance —	*Initial:* 0.15 ohms
Relay Rated Life —	*Low load:* 200,000,000 closures; *Maximum load:* 100,000,000 closures
Relay Contact Speed —	*Operate:* 0.5 milliseconds; *Release:* 0.5 milliseconds; *Bounce:* 0.5 milliseconds
Connectors —	(1) DB37 male
MTBF —	>150,000 hours (calculated)
Temperature —	*Operating:* 32 to 122°F (0 to 50°C); *Storage:* -4 to +158°F (-20 to +70°C)
Humidity —	10 to 90% relative humidity, noncondensing
Power —	From the bus
Power Consumption —	*Supply line:* +5 VDC; *Rating:* 270 mA
Size —	4.2"H x 4.9"W (10.7 x 12.4 cm)

2. Introduction

2.1 Technical Description

The 16 Relay I/O Card relay output board provides two parallel input/output (I/O) ports. The ports are organized as Ports A and B and are reed-relay output ports. (See the table below.)

Base Address	Hex	Decimal	Mode
Port A Address:	302	770	Output Port (Reed Relays)
Port B Address:	303	771	Output Port (Reed Relays)

Note that Ports A and B are output ports with read-back capability. That means that they can be written to (outputs) and then read back as inputs. Whatever was written will always be read back (binary complement). This allows for bits to be set or reset without altering the state of the other port bits.

2.2 Relay Output Circuit Description

The output ports on the 16 Relay I/O Card relay output are connected to 16 DIP reed relays. Reed relays provide very-high-quality, long-life, low-current (10-watt maximum), dry-contact switch closures. Reed relays are not suited for high-current applications, and can be destroyed by inductive load switching, where a spark occurs across the contacts internally. The relays are normally open, and close when energized. Each relay can be individually energized by writing a “1” to the proper port bit. The table on the next page shows which bit controls which relay.

Port Bit		Relay K-#	DB37 Male Connector and Pin No.
Port C Bit	0	K16	P2-2, 20
	1	K15	3, 21
	2	K14	4, 22
	3	K13	5, 23
	4	K12	6, 24
	5	K11	7, 25
	6	K10	8, 26
	7	K9	9, 27
Port D Bit	0	K8	P2-10, 28
	1	K7	11, 29
	2	K6	12, 30
	3	K5	13, 31
	4	K4	14, 32
	5	K3	15, 33
	6	K2	16, 34
	7	K1	17, 35
Ground			P2-18, 36, 37
+5 volts			P2-19
+12 volts			P2-1

2.3 Programming Examples

To set Relay #3 on, write a "1" in bit position 3, to port address Base+2, or 302 Hex.

```
MOV DX, 302H            ;Set DX to Port A
MOV AL, 0000 1000B      ;Set BIT 3 TO A "1"
OUT DX, AL
```

Another method that takes into account the read-back capability of the output ports A and B:

```
MOV DX,302H             ;Set DX To Port A
IN AL,DX                ;Get old port setting
NOT AL                  ;Invert for negative logic******
OR AL,0000 1000B        ;OR in bit 3
OUT DX,AL               ;Set Bit 3 w/o altering other bits
```

NOTE

Reading back the ports (A and B) results in the binary complement of what you originally output.

3. Address Selection

The 16 Relay I/O Card relay output board occupies a total of two consecutive I/O locations. A DIP switch is used to set the base address for these locations. Be careful when selecting the base address, as some selections conflict with existing PC ports. The following table shows several examples that usually do not cause a conflict.

Address	Binary	Switch Settings							
		1	2	3	4	5	6	7	8
282-283	10 1000 001x	Off	On	Off	On	On	On	On	On
286-287	10 1000 011x	Off	On	Off	On	Off	On	On	Off
38A-38B	11 1000 101x	Off	Off	Off	On	On	On	Off	On
3A2-3A3	11 1010 001x	Off	Off	Off	On	Off	On	On	On
3A6-3A7	11 1010 011x	Off	Off	Off	On	Off	On	On	Off
302-303	11 0000 001x	Off	Off	On	On	On	On	On	On
306-307	11 0000 011x	Off	Off	On	On	On	On	On	Off
2EA-2EB	10 1110 101x	Off	On	Off	Off	Off	On	Off	On
2EE-2EF	10 1110 111x	Off	On	Off	Off	Off	On	Off	Off
322-323	11 0010 001x	Off	Off	On	On	Off	On	On	On

The following table shows the correlation between the DIP switch setting and the address bits used to determine the base address. Assume 302 Hex to 303 Hex is the desired base address. 302 Hex = 1100 00XX in binary.

NOTE

Address line A1 is always a "1."

Switch Position	Address Line	Binary	Switch Setting
1	A9	1	OFF
2	A8	1	OFF
3	A7	0	ON
4	A6	0	ON
5	A5	0	ON
6	A4	0	ON
7	A3	0	ON
8	A2	0	ON

Note that setting the switch ON (or Closed) corresponds to a "0" in the address, while leaving it OFF (or Open) corresponds to a "1." Note that setting the switch

4. Installation

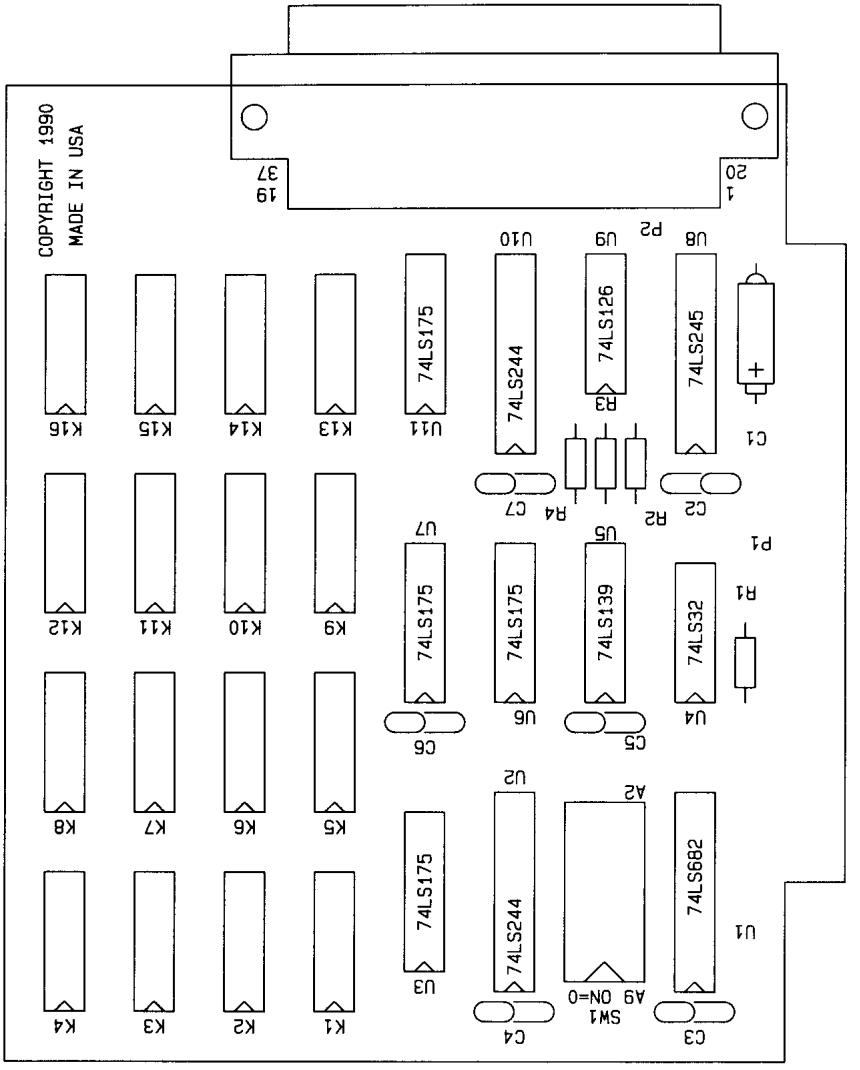
The 16 Relay I/O Card can be installed in any of the PC expansion slots.

To install the Card:

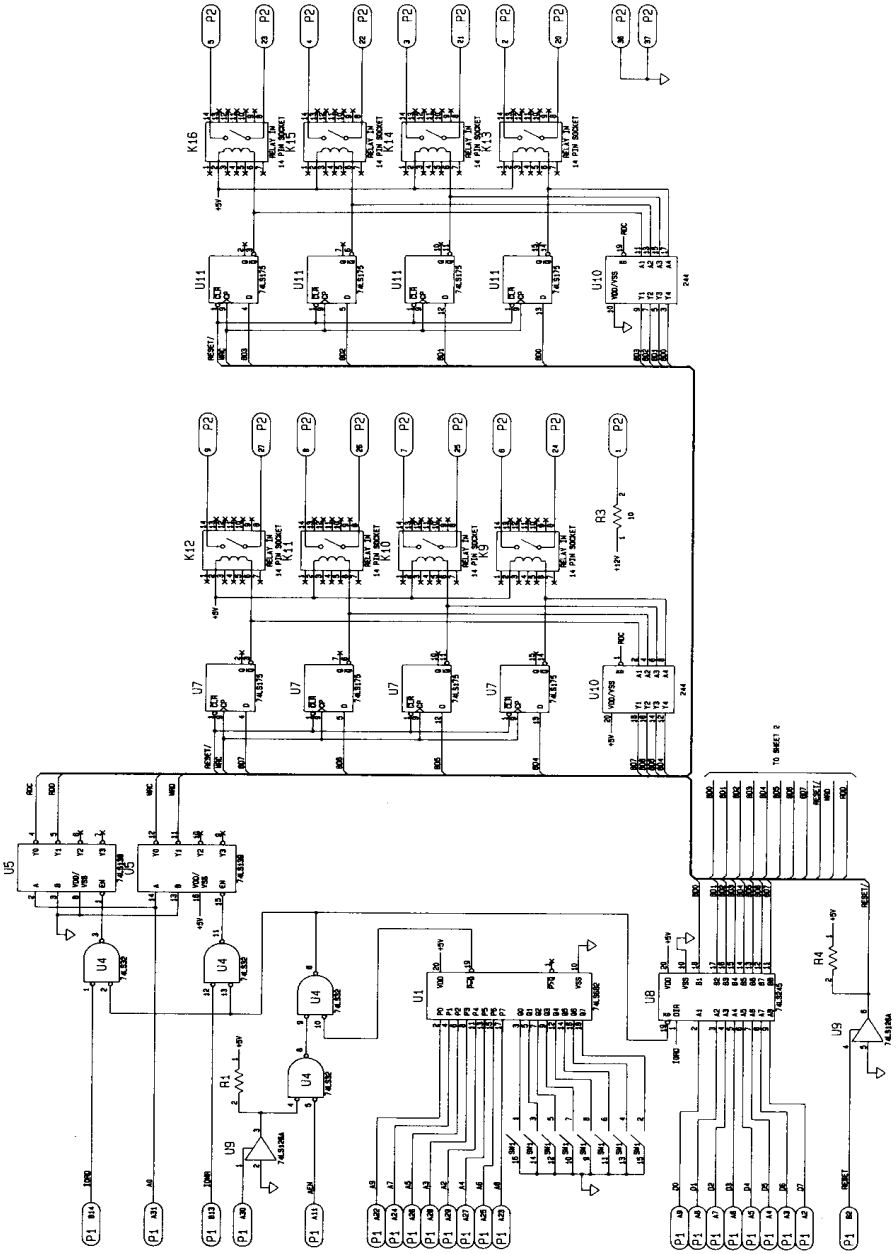
1. Turn off all PC power and disconnect the power cord.
2. Remove the cover of the PC.
3. Locate an available slot and remove the blank metal slot cover.
4. Gently insert the 16 Relay I/O Card into the slot. Make sure the Card is seated properly.
5. Replace the PC's cover.
6. Connect the power cord.

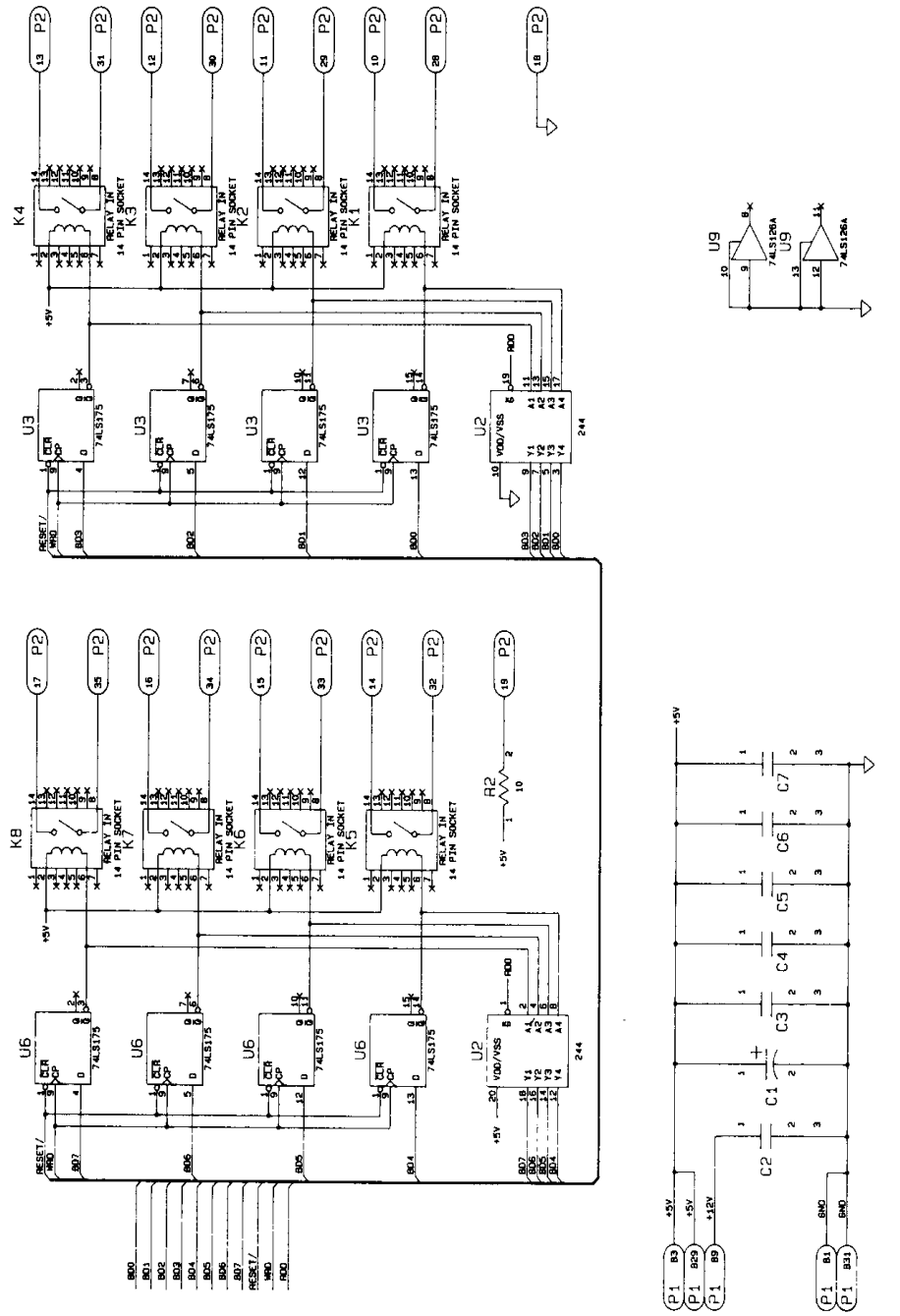
Installation is complete.

Appendix A. Block Diagram



Appendix B. Schematics




K4
K3
K2
K1
K8
K7
K6
K5
RELAY IN
14 PIN SOCKET
P2
U3
U6
U2
U9
74LS175
74LS126A
244
R2
C1
C2
C3
C4
C5
C6
C7
+5V
+12V
GND
RESET/
WRD
RDD
B00
B01
B02
B03
B04
B05
B06
B07

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